

Sydney - Brisbane Land Transport

Philip Laird
University of Wollongong, NSW, Australia

1 Introduction

This paper shall commence with reference to the draft AusLink Sydney - Brisbane corridor strategy. Section 2 will outline the upgrading of the Pacific Highway, Section 3 will examine the existing Sydney - Brisbane railway whilst Section 4 will outline some 2009 - 2014 corridor upgrade options with particular attention to external costs and energy use as opposed to intercity supply chain costs. The conclusions are given in Section 5.

The current population of the coastal regions of the Sydney - Brisbane corridor exceeds 8 million. As shown by Table 1, the population is expected to be approaching 11 million by 2031. The draft strategy notes that Brisbane and South East Queensland will become Australia's second largest conurbation by 2026.

The draft Sydney - Brisbane strategy was placed on exhibition in May 2007 by the Department of Transport and Regional Services (DOTARS - 2007). This was one of 24 corridor strategies as part of the AusLink planning process. This Sydney - Brisbane strategy states that its corridor is a major contributor to Australia's economic activity; also, the AusLink Network has three components within this corridor: a standard-gauge rail line (940km); an inland road route (940kms); and a coastal road route (890km) that includes the Pacific Highway.

The Sydney - Brisbane corridor has relatively high volumes of non - bulk freight and passengers that is second only to Sydney - Melbourne in Australia. Freight on the Sydney to Brisbane corridor will almost triple over the period to 2029, rising from approximately 7 million tonnes in 2004 to approximately 17 million tonnes. This compares to an expected doubling of freight on most other AusLink corridors. The draft strategy (DOTARS, 2007, page i) demonstrates that despite extensive work now underway to upgrade both highways and railways on the Sydney - Brisbane corridor, present *"road congestion and capacity constraints"* are expected to become increasingly severe and that the rail corridor *"...will continue to have capacity and alignment problems."*

Table 1 Population forecasts for Sydney - Brisbane corridor regions

Region	Millions		
	Current	2026	2031
Sydney	4.0	-	5.1
Central Coast	0.3	-	0.36
Lower Hunter	0.6	-	0.76
Mid North Coast	0.33	-	0.42
Far North Coast	0.23	-	0.29
South East Queensland	2.68	3.84	-
Total	8.19	3.84	6.98

Reference: Sydney - Brisbane corridor strategy (DOTARS, 2007, Table 1, page 19) with data sources including Australian Bureau of Statistics, and those of the New South Wales and Queensland Governments. The data has been rounded and added to give future projections.

Six strategic issues are stated (DOTARS, 2007, page ii) in the draft strategy as follows:

1. road safety, especially on road sections with high volumes of freight and passenger vehicles, through towns and at level crossings;
2. managing congestion on urban fringes and at major urban and regional centres;
3. the condition of the ageing road and rail infrastructure, which affects safety and efficiency;
4. the amenity of towns and major urban areas along the route;
5. improving the rail system; and,
6. planning for corridor protection, reservation and use to meet future requirements.

Some eight key challenges are noted in the draft strategy, and are summarised as below

1. Strong growth in population along the corridor;
2. Strong economic growth;
3. Expected trebling in end to end freight activity;
4. Significant and rapid growth in commuter traffic;
5. Managing road congestion, capacity, safety and traffic issues;
6. Maintaining and improving the road and rail infrastructure condition;
7. Managing rail congestion, efficiency and safety; and,
8. Effective planning for growth.

2. Pacific Highway upgrades

In 1996 some 65 km, or 9 per cent, of the Pacific Highway from Maitland to the New South Wales/Queensland Border (total length 672km) had four lanes. Since 1996, a high priority has been given by the New South Wales and Federal Government to upgrading this highway. With a combined outlay of about \$2.2 billion to June 2006, some 168 km of dual carriageway was built, with construction work and advanced planning started for other upgrades. In December 2006, the NSW Minister for Planning gave Pacific Highway upgrades 'critical infrastructure' status to expedite planning approvals.

In December 2005, a joint funded program of \$960 million for the three years to 2009 was announced. Later, the NSW and Australian Governments each contributed a further \$160 million. This makes a total of \$1.3 billion for upgrading the Pacific Highway from 2006 to 2009. The present goal is to have the entire Pacific Highway upgraded to dual carriageway standard by 2016. As recently noted by the Deputy PM, Mr Vaile (Media release 8 May) "*There are now construction contracts in place to upgrade 74 kilometres of the highway.*"

On Queensland's Pacific Motorway (91km), extensive upgrading has taken place since 1996. This includes an eight lane section over 35 km. Further upgrading is in place in Queensland, and straddling the NSW/Qld border, the 14.5 km Tugun bypass is now under construction at a cost of \$543 million with funding from three governments. It will include a tunnel allowing for the extension of the airport runway. The project, which will relieve traffic congestion on the Gold Coast and Pacific highways, is now scheduled to open in early 2008 and ahead of schedule. Recent and current NSW Pacific Highway projects are noted in Table 2.

Road capacity along the F3 Freeway from Sydney to near Newcastle (172km), and Pacific Highway/Motorway is noted in the draft corridor strategy (DOTARS, 2007) as generally sufficient for current needs, except at high traffic volume locations such as:

- along the F3 Freeway in various sections which are congested during peak commuter periods;
- where the coastal route passes through major urban centres; and,
- along the Pacific Motorway between the Gold Coast/Tweed and Brisbane.

Table 2 New South Wales Pacific Highway projects

Location	Length (km)	Cost (\$m)	Status
Karuah Bypass	9.8	123	Opened Sept 2004
Karuah to Bulahdelah I	11	114	Opened Dec 2006
Karuah to Bulahdelah 2 and 3	23	262	Due mid 2009
Bundacree Creek - Possum Brush	9.7	115	Opened mid 2006
Taree to Coopernook	7.5	59	Opened August 2005
Coopernook Bypass	4.2	69	Opened March 2006
Coopernook to Herons Creek*	32	-	Due Dec 2009
Kempsey to Eungai**	40.9	-	
Bonville Deviation	9.6	245	Due 2008
Sapphire to Woolgoolga	24	-	
Tintenbar to Ewingsdale***	17	-	
Macksville to Urunga****	36.8	-	
Ballina Deviation Bypass	9.6	245	Due 2008
Brunswick Heads to Yelgun	32	256	Opened July 2007

*Includes Moorland to Herons Creek

** The Australian Government will provide \$13 million (\$3 million in 2007-08 and \$10 million in 2008-09) toward planning and pre-construction work on the project.

*** to replace the two lane highway which winds over hills and around curves.

**** new commitment which will shorten the Pacific Highway

Reference: DOTARS Budget statement May 2007 re Auslink National Network and Roads and Traffic Authority of NSW Annual Reports for 2005 and 2006. Pacific Highway safety works are also listed as joint projects of the both governments. All are joint projects except for the Coopernook Bypass which was funded by the NSW Government.

Some eight Sydney - Brisbane short - term road priorities are noted in the strategy (DOTARS, 2007, p30, 31). The first two road priorities are to achieve substantial completion of Pacific Highway Upgrades, and to address other road capacity and congestion issues.

2.1 Wider issues

There is strong government and much community support to upgrade the Pacific Highway. However, community concern about more trucks on the Pacific Highway is growing, as shown by an inquiry of the NSW Legislative Council's General Purpose Standing Committee (GPSC) No.4 into the Pacific Highway, many newspaper articles and letters (by way of example, Sydney Morning Herald 'Call for highway ban on big trucks', January 13 2007, 'Agony of the highway to hell' December 23 2006 and 'Russian roulette on the roads as trucks hurtle by' December 9 2006), and an active website (Pacific Highway Alliance, 2007). The GPSC 2006 report (GPSC 2006) found much community disquiet and stated that there had been an increase in heavy vehicle numbers from 340 per day in 2001 to 1230 in late 2002. Reasons for the appreciable increase in Sydney - Brisbane road freight include:

- the opening in August 2002 of the Yelgun - Chinderah sections of the Pacific Highway and the concurrent approval of the NSW Roads and Traffic Authority to allow B-Doubles unrestricted access to the entire Pacific Highway;
- transfer of some Sydney - Brisbane trucks from the New England Highway;
- a growing economy; and, a loss of some freight from rail.

A GPSC recommendation calling on the NSW Government to accept its responsibility for strategic freight planning was effectively deferred to the Federal Government AusLink process and the AusLink corridor strategy. The GPSC (2006, page xiii) report also called on the NSW government, inter alia to "... *outline measures to encourage a shift from road to rail freight, including through integrated strategic planning for both road and rail upgrades.*"

Data supplied by the NSW Roads and Traffic Authority to the University of Wollongong (Laird, 2005) shows that for the ten years to 31 December 2003 and for road accidents on the Pacific Highway from Maitland to the Queensland Border, articulated trucks were involved in 30 per cent (163) of all 551 road fatalities; also, for the calendar year 2003 road accidents on this highway resulted in 72 fatalities, of which 23 involved articulated trucks. For the calendar year 2004, road accidents on these sections of this highway caused 40 fatalities, of which 11 involved articulated trucks; also on the Sydney-Newcastle Expressway that year there were two fatalities, of which one involved an articulated truck.

The issue of truck traffic impacts was noted by the Productivity Commission (2006, page C.14) which noted that participants to the above cited GPSC inquiry '*frequently attributed their road safety fears to the mixing of passenger and heavy vehicles on the one road.*'

2.2 Tolls

One question is whether tolls will be used to expedite Pacific Highway upgrades. Tolls were in place from the 1960s at Berowra and were used to fund highway upgrades. In 1988, they were removed by the NSW Government (with the support of the Federal Government). In 1993, the NSW Government proposed under a "Motorway Pacific" plan that the reconstruction of the Pacific Highway be expedited by the use of toll roads. Since 1988 when the tollway at Berowra was closed, all Pacific Highway upgrades have used public funding. On 23 December 2005, an agreement between the NSW and Federal Government established a Working Party including officers from NSW Agencies (RTA and Treasury) and DOTARS to undertake economic and financial analysis of the Motorway proposal and to develop and finalise details regarding issues including year by year funding arrangements including options to accelerate completion such as tolls and private sector involvement.

In addition to generating funds for road upgrades, tolls can contribute to vehicle use demand management on congested roads.

2.3 Shared road - rail corridors

Shared road - rail corridors are land corridors to be used for both road and rail. They have been provided for the Tugun bypass near the Queensland NSW border. Shared corridors are to be found elsewhere in Queensland and feature extensively in the Perth urban rail network.

By way of contrast to Queensland and WA, with the exception of Tugun, the Roads and Traffic Authority of NSW (RTA) has declined to date to make provision for shared corridors with Pacific Highway upgrades. Two cases in point are the Moorland to Herons Creek Pacific Highway upgrade (RTA, 2006 which at least notes shared corridors) and Kempsey to Eungai. (RTA, 2007 which fails to note the issue). Shared corridors were previously raised

with the RTA by the Railway Technical Society of Australasia (RTSA, 2004, 2005). A related NSW Department of Planning Report (2006) had no reference to shared corridors.

The GPSC (2006, page 109) report conveyed the view of the RTSA that there would be a marginal additional cost from packaging rail and road upgrades together: "... we are saying if you are going in there with roads, look at it for rail because it is only very marginal to acquire a bit more land while at the same time doing a road, or while you are doing the bulk earth works for the road you can do the bulk earth works for the rail, and the marginal costs to complete the rail line are insignificant... Surely in the concept stage we could look at the combined rail – road corridor from an environmental and social point of view."

Meantime, Government at one level and/or another should be able to bear the additional incremental cost of environmental impact assessment, land acquisition and preliminary earthworks of shared corridors. Auslink as an integrated transport program could usefully require full consideration of combined road – rail corridors.

3 The present Sydney - Brisbane rail corridor

As noted in the draft corridor strategy, there are severe constraints on the Sydney to Broadmeadow line. The Maitland - Brisbane line was considered in 1989 in a consultants report for the State Rail Authority as a candidate for closure and in 1994 was noted by the National Transport Planning Taskforce to be the 'weakest link' of all interstate lines in Australia. At present, freight trains average only 50 km per hour, due to excessive 'dwell time' waiting at sidings etc, plus excessive length and poor alignment. Together with Sydney - Melbourne, the Sydney - Brisbane track was rated as F (*Inadequate for current and future needs*) by Engineers Australia (2001).

The present Sydney - Brisbane rail link was completed in 1932 through Maitland, Grafton and Kyogle. The Maitland to Kyogle rail track is basically a string of branch lines built to steam age alignment and joined together in the early twentieth century. Some details are given in Table 3. By 1905 only the Grafton - Casino - Mullumbimby section was in place. By 1915, this section had been complemented by four further branch lines, all built to a very basic standard with a 'steam age' alignment that has excessive tight radius curvature and numerous speed restrictions. The various NSW linking sections completed by 1923 were also built to a basic standard. The Kyogle - Qld Border (completed in 1930 to link standard gauge to South Brisbane) was also on 'steam age' alignment complete with a spiral loop.

Table 3 – New South Wales North Coast Line

Section	Year completed
Maitland - Dungog	1911
Dungog - Taree	1913
Taree – Wauchope	1915
Wauchope – Kempsey	1917
Kempsey – Macksville	1919
Macksville – Raleigh	1923
Raleigh – Coffs Harbour	1915
Coffs Harbour – Glenreagh	1922
Glenreagh – South Grafton	1915
Grafton – Casino	1905
Casino – Kyogle	1910

Kyogle – Queensland Border 1930

Reference: Quinlan and Newland (2000). Note Mullumbimby – Lismore was completed in 1894, Lismore - Casino in 1903 and the Grafton Bridge was opened in 1932.

Table 4 Aggregate lengths of Strathfield - Acacia Ridge rail track with tight curves, number of circles traversed, and steep grades on tight curves

Section of Track	Length km	Tight curves km	Number of circles per 100 km	Circles km	Steep grades on tight curves km
Strathfield - Maitland	181	57	27	15	14
Maitland - Grafton	506	237	111	22	0
Grafton - Acacia Ridge	274	102	39	14	14
Total	962	396	177	18	28

Reference: Laird (1998). Number of circles added. Compiled from rail system computer file data with aggregate data rounded to 100 metres. Data is qualified and for track as at end of 1996. Tight curves refers to curves of less than 800 m radius and steep grades are those with a grade of less than 1 in 66.

The only grade and curve easing since 1930 known to this writer took place in the mid 1990s as part of the Keating Government's 'One Nation' programme. This was in two locations north of Grafton. Using computer track file data which gives at 10 metre intervals the grade and the radius of any curve, it is possible to calculate the angle subtended by each curve on the track. Adding these angles gives the number of circles as in Table 4.

It can be seen that a train moving between Sydney and Brisbane negotiates a total of about 177 circles – some 88.5 to the left and 88.5 to the right. This reflects the original 'Branch Line' status of most of this 'long and winding' track. The corresponding number of total circles for Sydney to Melbourne is 72 and averaging 8 circles per 100 km. The worst Main South section is Junee - Goulburn with 15 circles per 100 km. No less than 47 per cent of the Maitland - Grafton track has curvature of radius less than 800 metres. The corresponding percentage for the Melbourne- Perth "East - West" rail corridor, with its easier terrain and better standards, is 3 per cent.

3.1 The current rail work programme

In September 2004, after protracted negotiations with the New South Wales Government, the Federal Australian Rail Track Corporation (ARTC) assumed a 60 year lease over NSW mainline track including from Broadmeadow to the Queensland Border. Over the next three years, ARTC's Maitland Brisbane work is to include concrete resleepering, 1500 metre loops (four new ones, 10 shorter ones extended and 18 existing 1500 metre ones upgraded with at least one rail freight operator, Pacific National (2007) seeking 1800 metre loops) plus other work including a long overdue upgrade of the safeworking system between Casino and Acacia Ridge. This is to replace an obsolete system (Australian Broadcasting Commission, 1998) that imposes additional costs on train operators requiring a stop at each loop, conservatively estimated to cost \$106 per stop per freight train (Michell and Laird, 2002).

At the conclusion of this work by the ARTC by 2009, transit times from Sydney to Brisbane for 1500 metre superfreighters are estimated to decrease by nearly 4 hours from 19 hours 22 minutes to 15 hours 30 minutes. This compares with about 11 hours and 15 minutes for road transport. On time reliability for interstate rail transport is also expected to improve from only 40-45 per cent on the Sydney to Brisbane corridor (within 15 minutes of scheduled departure) whilst the comparable figure for road is above 95 per cent (DOTARS, 2007, p14).

It is of note that much of the ARTC track upgrading is being funded from its own sources. Other work underway to improve rail on the Sydney to Brisbane corridor, as noted in the draft strategy (DOTARS, 2007, page 14) includes: RailCorp Clearways Projects with platforms to allow freight and inter-city trains to by-pass terminating passenger trains at Berowra (completed) and Hornsby (under construction); Acacia Ridge level crossing grade separation at Beaudesert Road approaches to Acacia Ridge intermodal terminal (under way); and, certain Hunter Valley Rail upgrades, including the Sandate flyover completed in late 2006.

Despite this work, the draft strategy (DOTARS, 2007, page 14) notes that *"The rail network is heavily capacity constrained for freight services, particularly between Sydney and Newcastle, where freight services share the track with commuter and long-distance passenger services. Freight trains are timetabled outside of the morning and evening peaks due to the priority given to passenger trains. ... In addition, performance issues also arise from track curvature, alignment and gradients which limit capacity and wheel loads of trains, and there are several bridges with structural deficiencies. Steep hills to the north of Sydney at Cowan Bank also make it difficult for freight trains as their heavier loads mean they travel more slowly than commuter trains and their greater length adds to line congestion."*

In looking to 2030, the draft strategy (DOTARS, 2007 (page 14) notes that *" Train paths on the rail corridor, presuming it continues to serve Melbourne to Brisbane, will be limited because of the single track north of Maitland, conflicts with passenger trains in Sydney and Newcastle and, in northern Sydney, track congestion, gradients and environmental limitations like National Parks and waterways. Insufficient intermodal capacity in Sydney and Brisbane also needs to be addressed in the early part of the strategy period."*

4 A 2009 -14 Sydney Brisbane corridor upgrade programme

As noted above, it is a priority of both the Federal and NSW Government to complete a dual carriageway Pacific Highway by 2016. The use of tolls for some upgrades would not only expedite this work and assist with vehicle use demand management but also complement the approach where part of the Maitland - Brisbane rail track upgrading is paid for by those who consign freight by rail. This is opposed to the situation where there is some debate on recovery of road system costs from heavy trucks, with under-recovery from 9 axle B-Doubles being \$23,000 per year (Productivity Commission, 2006, Table 5.3, page 125).

Regarding the Sydney – Brisbane railway, it is necessary to note a somewhat negative view for further track upgrading past the present work as noted by a North South Rail Corridor Study (DOTARS, 2006a, Chapter 1, p16). *"Further infrastructure investment beyond the current ARTC program does not indicate substantial additional benefits in terms of either significantly reduced transit time or greater demand. The Study Team analysis suggests that the current problems associated with congestion north of Sydney can not be easily or cost effectively addressed."*

A different perspective was taken by Mr Paul Neville MP as the HORSCTRS Chair (Australian Broadcasting Commission, 2007) *"We know that the freight task is going to double in the next 20 years, and because of that, our roads will become totally and utterly congested if we don't do something serious about rail in that time. I'm saying if we're not*

progressing rail in parallel with road, in other words if rail doesn't really catch up, all we're doing is exacerbating the amount of freight that will go on the newly upgraded roads, and that would be ones like the Hume Highway and the Pacific Highway."

4.1 Sydney - Brisbane further track upgrading options

It is appreciated that intermodal freight terminals in Brisbane and particularly Sydney are capacity constrained (DOTARS, 2006b and House of Representatives Standing Committee on Transport and Regional Services (HORSCTRS), 2007). It is suggested that in addition to upgrading terminals, extensive mainline rail track upgrading past the current ARTC programme is required. Such track upgrading could well include track straightening on both the Hornsby to Broadmeadow and Broadmeadow to Brisbane sections of track, which is covered in more detail below. The extent of track straightening would depend whether an inland Melbourne - Parkes - Brisbane railway is built. Neither the 2006 North South Rail Corridor Study nor a 2007 draft Melbourne - Brisbane corridor strategy provide an answer as to whether an inland route should precede a further major upgrade of the existing coastal corridor. Over time, it is suggested that both will be needed.

Both Australia and overseas experience demonstrate that rail deviations built to modern engineering standards give wide ranging benefits. By way of example (Laird, 2006), gauge standardisation between Perth and Kalgoorlie in the 1960s included a new section with high clearances and easy ruling grades replacing an older section with steep ruling grades and poor alignment. This assisted in reducing freight train times from 31 hours to 13 hours.

Today, as noted by ARTC, rail wins 81 per cent of interstate freight in and out of Perth on the East – West corridor (as opposed to rail's 12 per cent share of Sydney – Brisbane intercapital freight as noted in Section 4.3). Rail's high modal share on the East – West corridor would be simply impossible on the old track. This high modal share is also due to Australian National's concrete resleepering in South Australia (1978-95) and the Melbourne Adelaide Rail Standardisation (MARS) project (1992-95).

In July 1995, when freight forwarder SCT started their Melbourne – Perth rail freight service as an early application of National Competition Policy, a weekly 600 metre train with 22 louvre vans was placed into service. Today, SCT run four and sometimes five trains per week with each train having up to 70 wagons (1800 metres). This growth factor is at least twelve. Other data shows that the rail freight task on the East - West corridor has experienced very strong growth from 1994 - 95 to 2003 - 04.

The strong growth on the East - West corridor would not have been possible without the major initiatives that were supported with some Federal funds. The little or no growth of rail freight on the North - South corridor, linking Australia's three largest cities, in part reflects the substandard track. A further factor is rebuilding in recent decades the Hume and Pacific Highways at a cost exceeding \$10 billion to 2007 in current terms.

Extensive track straightening extending for over 160 km in many locations between Brisbane and Cairns was undertaken by the Queensland Government from 1986 to 1996 as part of its Mainline Electrification and its Mainline Upgrade (MLU) programmes.

An outline of the 1990's MLU project, and compelling reasons for proceeding with it, were given by the Project Manager, Mr Ross Hunter *"Without substantial upgrading, the quality of rail freight services possible could not keep pace with the quantum improvements enjoyed by our major competitor, road transport. Rail would continue to lose market share, compounding the losses from having to retain services. The Mainline Upgrade Project is targeted at improving services and picking up market share, and reducing the costs of*

providing these services to enable rail to compete more effectively on price."

In summary, the benefits of selected rail deviations include:

1. Reduced point to point distance (except for extensive grade easing),
2. Faster and heavier freight trains,
3. Improved reliability of freight train operations,
4. Improved rail passenger services,
5. Appreciable savings in fuel and brake wear to train operators,
6. Reduced track maintenance costs,
7. Elimination of level crossings, flood mitigation, and improved clearances,
8. Fewer road accidents involving heavy trucks,
9. Reduced diesel use and greenhouse gas emissions due to rail's superior energy efficiency in line haul freight (a factor of about three to one), and,
10. The ability of an upgraded rail system to defer considerable expenditure on the augmentation of road capacity, including four lane sections to six lanes.

As noted above, two small rail deviations north of Grafton at Lawrence Road and Rappville were completed in mid 1995. The combined length of the two deviations was 9.8 km which was 0.9 km shorter than that of the original track. The older track alignment with 1 in 50 grades and many tight radius curves was replaced by improved track with 1 in 70 ruling grades. The net result, with both deviations, was a saving of about 5 minutes in time, along with reduced fuel use and maintenance costs. The average cost of the two deviations, including new or extended crossing loops, was about \$1.3 million per kilometre.

The Auslink White Paper (DOTARS, 2004 p37) refers to *"...building deviations at 14 locations, totaling 121 kilometres, to ease curves on the North Coast railway between Newcastle and Brisbane (\$158 million)."* A special allocation of \$450m to the ARTC, with a reference to projects such as "to straighten out the track" was cited by the Treasurer in his May 2004 Federal budget speech. An ARTC report in circulation during February 2005 noted potential rail deviations including those listed in Table 5. The total cost of the 8 deviations was estimated at about \$900m and the total time saving was just over two hours.

After the ARTC's examination of potential rail deviations for NSW, it was decided in May 2005 to defer them in order to concentrate on more pressing track and signal upgrades. This was with an undertaking that *"...Deviations will be further analysed for future AusLink funding packages and ARTC will undertake more detailed analysis of deviation options during this period."*

Meantime, as noted by Queensland Transport Minister, there is now a need, to *"...reserve rail corridor land before it becomes a costly issue"* (Hon Paul Lucas MP 2005).

Table 5 – ARTC 2005 North Coast rail deviations - ranked in order

	Location of Start km	Existing Distance km	Cost \$m	Time saving minutes
Nambucca Heads - Bonville	565.1	31.4	39	8.8
Taree - Johns River	383.3	34.5	76	12.5
Taree North Bypass	375	7.9	20	3.2
Tamban - Nambucca Heads	520.6	44.5	118	17.5
Kundabung -Tamban	487.2	33.4	72	10.1
Fassifern - Hexham	142.3	33.2	123	16.5

Rossgien - Telegraph Point	439.1	34.9	86	10.8
Hexham - Stroud Road	176.5	93.5	361	43

Reference: ARTC 2005) Some rounding has taken place. The list was compiled from a detailed examination of all potential deviations.

4.1.1 Hornsby to Broadmeadow

There is a need for commitment by both the NSW and Federal Governments to improve Hornsby - Broadmeadow freight and passenger operations. The objectives to be considered include:

1. Increasing freight capacity (now around 20 paths each way over some 14 hours of the day - there is a need for up to 50 paths over 22 hours or more per day);
2. Shortening running times for all trains;
3. Reducing grades for freight trains (irrelevant for passenger trains); and,
4. Providing reliability for all trains on the upgrade of the Cowan Bank.

A third track combined with curve easing on the Cowan Bank could be coupled with a ridge top passenger line. This line could use steep grades and short tunnels to get a high speed alignment from north of Cowan to south of Mt Kuringai (able to be used by all passenger trains). This should be a substantially lower cost solution to these challenges than an Mt Kuringai - Hawkesbury River tunnel earlier proposed within the NSW Government, or an outlay of \$1127.6m as noted in the NSRCS (DOTARS, 2006 page 6-56).

In addition to consideration of a Fassifern - Hexham bypass, the 5.2 km of track between Fassifern (142.4 km) and Teralba (147.6 km) invites attention as it includes 3540 metres of tight curves of radius 320 to 400 metres and a hill. This is an ideal site for a small deviation (Booragul Bypass) that would halve the point to point distance.

4.1.2 Broadmeadow to Acacia Ridge

As noted above, the Maitland to Grafton line has undue excess length (about 90km) and excessive curvature imposing severe speed weight restrictions. In respect of larger deviations close to the existing line to reduce point to point distance, and improve alignment, the following is work that could be undertaken between Grafton and Taree that was identified by a former 'One Nation' rail project team in Sydney (Laird and Adorni - Braccesi, 1996).

- i. A new deviation of Johns River north of Taree where a major deviation totalling 23 km of new track would eliminate many tight curves and save 7 km, to cut Taree -Johns River freight times from 33 to 15 min and XPT running time from 29 to 12 minutes.
- ii. South of Kempsey - Mingaletta. Replace a total of 9 km of windy track with substandard curves at cost of about \$8 million to lift speed to 115 km/hr.
- iii. North of Kempsey - Tamban. Replace a total of 9.6 km of track with substandard curves to save 1.4 km of distance and increase speed at cost of some \$10 million.
- iv. South of Coffs Harbour : Nambucca Heads - Sawtell. Replace a total of 9 km of track with substandard curves to allow a speed of 110 km/hr. Estimated cost: \$8.5 million.
- v. Braunstone - South Grafton. Realign 7 km at a cost of about \$8.5 million to improve a poor formation, eliminate 18 curves on a grade, lift speed, and reduce maintenance costs.

Along with raising the potential for shared road - rail corridors, Laird and Adorni - Braccesi, (1996) noted other track straightening options including:

- a. A Taree Bypass in addition to the Taree-Johns River deviation.
- b. A 5 km 'Little Lawrence' red sector location (sections of track with steep grades and sharp curves) to complement Lawrence Road deviation.

- c. Nearby locations with red sectors at Camira Creek to Rappville and Coombell
- d. Some 2.8 km of red sectors north of Grafton (704-725 km), plus 2.1 km from Casino to Kyogle (824-833 km).

A major rail deviation in question is Hexham – Stroud Road. Here construction of 67 km of new track would replace a substandard 91 km section with its poor alignment to halve transit times and reduce fuel use by 40 per cent. Computer simulation by Samron Pty Ltd (Laird et al, 2005, HORSCTRS, 2007)) indicates that for a 'standard' intermodal freight train with three 4000 HP locomotives, the benefits of the new track include a time saving of 42 minutes, a fuel saving of about 630 litres of diesel and a cost saving per train of at least \$960.

4.2 Freight modal shares and basic scenarios

The Bureau of Transport and Regional Economics (BTRE – 2006, page 59) notes that in 1996 road carried 3.014 million tonnes (mt) of Sydney – Brisbane intercapital freight, with 0.971mt for rail, giving road a 76 per cent modal share of land freight. By 2001, road had 4.926mt and rail 0.905mt indicating a 84 per cent share for road. By 2006, road tonnages had increased to 6.477mt (projected) in 2006 whilst rail tonnages due to data restrictions were assumed at the 2001 level of 0.905 mtpa (giving road 88 per cent of land freight).

This BTRE (2006) report gives forward projections for Sydney - Brisbane, with caveats, including for 2015 road freight at 15.535m tonnes and rail at 0.905m tones - a total of 16.44m tonnes. This would give road 95 per cent of land freight and rail just 5 per cent. Without the current ARTC work, it is likely that rail's modal share of land freight on this corridor would not exceed 5 per cent. The ARTC (2006) has anticipated, as a result of the work now underway, a doubling of rail tonnages on the Sydney – Brisbane corridor. However, increasing rail's modal share to say 25 per cent by 2015 may prove difficult to reach in the face of B-Triples using a fully upgraded Pacific Highway.

On the other hand, the resulting improvement in rail freight efficiency and competitiveness from construction of a 'fit for purpose' Sydney Brisbane railway combined with improvements in intermodal terminals and the application of 'user pays' and 'polluter pays' road and rail track pricing could well see rail win 50 per cent of Sydney - Brisbane rail freight (See Laird et al, 2002 and Little, 2007 re comment on such a modal share for the Sydney – Melbourne corridor).

External costs of road and rail freight in both urban and non-urban areas were addressed in the ARTC (2001) Track Audit. These estimates have been since revised (see, for example, Laird, 2005) and, as at 2000, these costs were 2.75 cents per ntkm for road haulage in urban areas, 1.98 for road haulage in non - urban areas, 0.43 for rail haulage in urban areas, and 0.17 for rail haulage in non - urban areas. These costs, adjusted to 2015 values (using CPI multiplier $155.6/125.2 = 1.243$ to 2007 and then increased at 3 per cent pa - a 57.7 per cent increase from 2000 costs) with other assumptions give estimates as in Table 6.

Table 6 Sydney – Brisbane external costs and fuel use in 2015

Road modal share	External costs	Diesel use
95	\$477m	317 million litres
75	\$371m	281 million litres
50 (upgraded rail case)	\$272m	223 million litres

Reference: See text, including 16.44m tonnes of Sydney – Brisbane intercity freight in 2015. Road distance is 890 km with 60 km in urban areas, existing rail distance is 940 km with 60 km in urban areas and for upgraded rail track with extensive track straightening, a point to point distance of 850 km is used. For all intermodal freight, a total road pick up and delivery of 50 km within urban areas is assumed, with one litre of fuel used for pick up and delivery.

4.3 Oil vulnerability and greenhouse gas emissions

Rail is approximately three times more energy efficient than road for line haulage of non-bulk freight. Rail's energy efficiency can be improved further by track straightening. Table 6 gives estimates of fuel use in 2015 for moving Sydney – Brisbane land freight. These are based on 20 litres per tonne for road line haul (from 1.15 net tonne km (ntk) per Megajoule (MJ) end use (38.6 MJ per litres) with increasing energy efficiency on an open road balanced out over time by increasing road congestion), 7.5 litres per tonne for line haul rail freight using existing rail (3.3 ntk/MJ) and 6.1 litres per tonne for using upgraded rail (3.6 ntk/MJ)

It can be seen from Table 6 that an upgraded Sydney – Brisbane rail system has potential of rail to save up to 94 million litres of diesel per year by 2015. This translates (at 2.69 kg of CO₂-e per litre of diesel) to about 250,000 tonnes of CO₂-e.

Rail also has the option of using electric traction. Electric traction is used by Queensland Rail for coal haulage in Central Queensland and this is now saving nearly 200 million litres of diesel per year. Rail electrification was also proposed for Sydney Melbourne by the Federal Government during 1980 at a time of high oil prices (Laird, 2006). If oil prices were to continue to trend up to the point that rail electrification was used from Sydney to Brisbane (on reconstructed track and not the existing substandard alignment), and assuming a rail modal share of 50 per cent the reduction in diesel use for Sydney - Brisbane rail freight would be an 50 million litres of oil per year by 2015. This would result in a total reduction of diesel use by 144 million litres per year. In the event that electrified rail was to win 75 per cent of the projected 2015 Sydney - Brisbane land freight, the reduction (from a 5 per cent rail share) by 2015 in fuel use would be 223 million litres per annum. This would increase over time. Further energy savings are possible with regenerative braking (Butcher, 2005).

In common with almost all other AusLink corridor strategies that each looked out to 2030, the Sydney - Brisbane draft corridor strategy did not note oil vulnerability. The issue was addressed by the Senate Rural and Regional Affairs and Transport Committee (2007). The Committee's recommendation # 7 is of particular note and follows: *... that corridor strategy planning take into account the goal of reducing oil dependence ... Existing Auslink corridor strategies should be reviewed accordingly.*

5 Conclusions

The Sydney - Brisbane corridor is a major contributor to Australia's economic activity. In terms of inter-capital city non - bulk freight and passenger movements, it is second only to the Sydney - Melbourne corridor. Inter - capital city freight on the Sydney to Brisbane corridor was approximately 7 million tonnes in 2004 and is expected to almost triple over the period to 2029. In 2006, about 88 per cent of the freight was moved by trucks along an upgraded Pacific Highway. Whilst the Pacific Highway continues to be rebuilt on an improved alignment, the existing railway upgrades are on an older 'steam age' alignment with excessive point to point length and curvature.

The resulting improvement in rail freight efficiency and competitiveness from construction of a 'fit for purpose' Sydney Brisbane railway by 2015 coupled with improved road pricing has the potential to give rail 50 per cent modal share of line haul freight. This option, compared with the 95 per cent road option, could save 94 million of litres of diesel each year as well as

reduce greenhouse gas emissions by about 250,000 tonnes per annum by 2015. It would also reduce transport costs and improve road safety with a reduction in external costs of about \$200 million per year. These are substantial economic, social and environmental benefits.

Acknowledgements

This paper complements research for the Sydney - Melbourne corridor (Laird, 2006) and extends a related paper (Laird, 2007). The author would like to thank Mr Max Michell of Samrom Pty Ltd and Ms Angela Evans, research assistant at the School of Mathematics and Applied Statistics for valued assistance along with the Rail CRC for support of earlier research cited in this paper. The assistance of the two anonymous referees is also appreciated. However the responsibility for the findings and views remains with the author.

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